

NOTES, INFORMATION & NEWS

Fact or Artifact?

by

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The conclusion by GILMER (1986) that the minute, skinny, and aberrant developmental stages in pteropods described by the present author are artifacts is rejected. Though the function of the developmental stages in the life cycle of pteropods, their ecology, and phylogenetic development are not fully understood, such stages exist and can be distinguished on the basis of published data (see literature in GILMER, 1986). Furthermore, living aberrant stages have already been described (PAFORT-VAN IERSEL, 1985), all of which induces me to comment on Gilmer's conclusions (referring throughout to the 1986 paper). For most literature references I also refer to GILMER (1986).

In the abstract, Gilmer states (p. 48) that "inaccurate anatomical observations" were made with regard to developmental stages, but nowhere in his paper is an accurate anatomical observation given. The paper deals only with the external morphology and body weight of complete living or preserved animals.

The term "aberrant" is considered by Gilmer to cover also skinny and minute stages. However, I have always used these three as different terms: all forms that are aberrant are not aberrant "stages." Lumping the terms is enormously confusing, the more so because the skinny and minute stages are more related to each other than to the aberrant stage.

Gilmer states (p. 48) that aberrants are unknown from living specimens. However, they have been described from living specimens (PAFORT-VAN IERSEL, 1985; PAFORT-VAN IERSEL & VAN DER SPOEL, 1986), and the skinny or minute stages are even known as fossils (JANSSEN, 1985).

Gilmer states (p. 51) that I described in 1962 and 1967 food particles from the gut of aberrants; I did not. VAN DER SPOEL (1967) described food particles from juveniles and minute stages, but for the aberrant stages it is described (1962, 1967) that the gut is not completely developed and without food.

Gilmer states (p. 51) that predation or parasites may be responsible for the aberrant forms, but I have indicated that this is not the case (VAN DER SPOEL, 1967:183, 1973:209).

More importantly, Gilmer studied the external morphology of living and preserved specimens, but nothing is said about their anatomy and histology. The anatomy and histology of minute, skinny, and aberrant stages was, how-

ever, fully described (literature in Gilmer) and they differ from the histology and anatomy of normal specimens. Gilmer gives no attention to this difference. Although fixation and preservation may alter external morphology and even the (always artificial) histological picture of tissues, they never alter anatomy, number of cells, types of organs, or configuration of muscles and ducts. I based the skinny, minute, and aberrant developmental stages on such structures.

Preservation affects normal and developmental stages in a probably comparable way, so it is sometimes impossible to tell from the external morphology of a specimen in which stage it is. Aberrants, skinnies, and minutes were originally described from preserved material and it is evident that they will have another appearance when alive (*cf.* GILMER, 1986:fig. 1c; PAFORT-VAN IERSEL & VAN DER SPOEL, 1986). Only thorough histological and anatomical study, not provided by Gilmer, can give an answer. Gilmer's criticisms made with regard to growth and shell formation in skinny and minute stages are correct. The mantle indeed has to be in contact with the shell to secrete it, and some preservation artifacts were probably misinterpreted by me; in living minute and skinny stages the mantle can reach the shell margin.

Gilmer's fig. 1a pictures a fully developed and living *Clio pyramidata*, whereas his fig. 1b shows a normal, preserved *C. pyramidata* not showing the glove-shaped body form of an aberrant stage. The specimen in fig. 1b is not, however, the same specimen as that in fig. 1a, although this is stated. The shell in 1b is broader than in 1a, which suggests that the two specimens may even have originated from different populations. Furthermore, the protoconch is preserved in the fig. 1b specimen after fixation, whereas it appears missing in the living specimens of fig. 1a. Thus it seems impossible that 1a and 1b are of the same specimen. These two pictures prove only that fixation alters body shape, a well known fact.

Gilmer's fig. 1c shows a young *Cuvierina columnella* with the caudal spine intact but without the closing septum below the teleoconch (this specimen should for this reason already be considered a skinny specimen). The body, except for the mantle gland, is extremely slender further indicating that this is a skinny stage. Fig. 1d represents a skinny specimen of *C. columnella* with all the characters of this stage; it is probably the same as that in fig. 1c. These two figures do not support Gilmer's ideas but rather my published data. With animals like those photographed more about shell formation in the skinny stage could have been studied.

Gilmer's fig. 1e shows a not yet full grown *Cavolinia tridentata*. Fig. 1f also shows a *C. tridentata* but not, as is stated, the same specimen as fig. 1e, judging from the

differences in the shape of the upper lip and lateral spines and the shell parameters. The specimen in fig. 1e is likely in a growth phase between the minute and adult stages, judging from shell development. However, only a histological study can prove if it is a minute or not; an external investigation is not sufficient here.

Finally, that a SCUBA diver does not easily encounter the skinny, minute and, especially, the aberrant stages in the relative small volume of water investigated is not astonishing. Such forms are only rarely found in museum material collected from millions of cubic meters of water.

Literature Cited

- GILMER, R. W. 1986. Preservation artifacts and their effects on the study of euthecosomatous pteropod mollusks. *Veliger* 29(1):48-52.
- JANSSEN, A. W. 1985. Evidence for the occurrence of a "skinny" or "minute stage" in the ontogenetical development of Miocene *Vaginella* (Gastropoda, Euthecosomata) from the North Sea and Aquitaine basins. *Meded. Werkgr. Tert. Kwart. Geol.* 21(4):193-204.
- PAFORT-VAN IERSEL, T. 1985. A contribution to pelagic zoogeography of the mid North Atlantic Ocean. Doctoral Thesis, Univ. of Amsterdam. 185 pp.
- PAFORT-VAN IERSEL & S. VAN DER SPOEL. 1986. Schizogamy in the planktonic opisthobranch *Clio*—a previously undescribed mode of reproduction in the molluscs. *Intern. Jour. Reprod. Develop.* 10:43-50.
- VAN DER SPOEL, S. 1962. Aberrant forms of the genus *Clio* Linnaeus, 1767 with a review of the genus *Proclio* Hubendick, 1951. *Beaufortia* 9(107):173-200.
- VAN DER SPOEL, S. 1967. Euthecosomata, a group with remarkable developmental stages (Gastropoda, Pteropoda). *J. Noorduyn & Zn: Gorinchem.* 375 pp.
- VAN DER SPOEL, S. 1973. Strobilation in a mollusc; the development of aberrant stages in *Clio pyramidata* Linnaeus, 1767 (Gastropoda, Pteropoda). *Bijdr. Dierkunde* 43(2):202-215, pls. 1, 2.

Response to "Fact or Artifact?" by

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by

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In GILMER (1986) I presented results from a simple experiment using live thecosome pteropods, regardless of the collection method. Van der Spoel's objections that the fig. 1 photographs are not of the same individuals are not only wrong but beside the point, as the figures merely show results that are easily repeatable. For clarification, all photographs in fig. 1 of GILMER (1986) are as labeled. The animal in fig. 1a was swimming when photographed—it is a ventral view and is slightly tilted; fig. 1b (after preservation) is a dorsal view in a flat plane so that the protoconch is now apparent.

I consider van der Spoel's statement (in "Fact or Artifact?") that the mantle can reach the shell aperture in his "minute" and "skinny" stages an admission that he misrepresented in his published descriptions what he considers to be their live morphology. This is not a trivial admission as van der Spoel relied heavily on external morphology in establishing these stages. The contracted, contorted body and mantle are supposed to be major characteristics of live individuals. Indeed, the "skinny" and "minute" names of the stages are obviously taken from the external morphology of preserved specimens. I find no histological or anatomical evidence from van der Spoel's descriptions of these two stages that could not be due to fixation artifacts.

Recent studies on the aberrant stages of *Clio*, primarily by Pafort-van Iersel (cited in "Fact or Artifact?"), correctly show the need to separate this phenomenon from the "minute and skinny" controversy. The apparent morphological changes that occur in some specimens of this genus may represent the first documented case of molluscan reproduction via segmentation and splitting of the body. Further work is necessary to demonstrate clearly whether this remarkable phenomenon is not a collection artifact caused by trauma in the plankton net or not due to parasitic infection, to which this particular genus is often subjected (*e.g.*, PERKINS, 1983; GOTTO, 1986).

Literature Cited

- GILMER, R. W. 1986. Preservation artifacts and their effects on the study of euthecosomatous pteropod mollusks. *Veliger* 29:49-52.
- GOTTO, R. V. 1986. A new parasitic copepod crustacean of uncertain affinities: *Megallecto thirioti* n. gen., n. sp. *Bull. Zool. Mus. Amsterdam* 10:185-189.
- PERKINS, P. S. 1983. The life history of *Cardiodectes medusaeus* (Wilson), a copepod parasite of lanternfishes (Myctophidae). *Jour. Crust. Biol.* 3:70-87.

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